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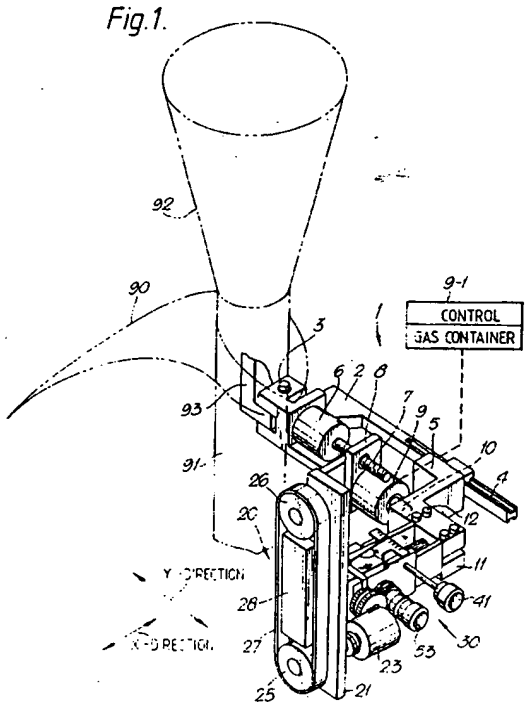
(54) Longitudinal sealer for packaging machine.

(57) A form-fill-seal type combined bag maker and packaging machine uses a longitudinal sealer to seal together mutually overlapping side edges of an elongated bag-making material wrapped around a loading cylinder (91) in a tubular form. The longitudinal sealer has a sealing unit (20) with a heater (28) supported by a mobile member (56) which can be selectably moved linearly or rotationally such that the sealing unit can be not only correctly positioned but also properly oriented with respect to the loading cylinder currently installed on the packaging machine. The mechanism for moving the sealing unit is supported on an elongate member (2) rotatably supported by the packaging machine so as to be easily moved away when the loading cylinder is removed and replaced by another of a different kind.

Fig.1.



EP 0 611 697 A2

This invention relates to a longitudinal sealer for a form-fill-seal combined bag maker and packaging machine (hereinafter simply referred to as a packaging machine), and more particularly to a device for adjusting the position of a heater in such a sealer. The invention further relates to a packaging machine incorporating such an improved sealer.

Consider, for example, a so-called vertical pillow type packaging machine which uses a former to bend an elongated web of thermoplastic sheet into a tubular form, while pulling it down over the peripheral surface of a loading cylinder through which articles to be packaged are dropped. The mutually overlapping side edges of the tubularly formed sheet are sealed together by a heater in a vertical (or longitudinal) sealer, and a horizontal (or transverse) sealer disposed below the loading cylinder seals the top edge of a bag and the bottom edge of the next bag at the same time. The vertical sealer is usually provided with a vertically extended endless belt such that the filling and sealing of the bags can be carried out continuously.

Packaging machines of this type are required to be able to produce bags of different shapes and sizes, depending upon both the nature and the amount of the articles to be packaged. For this reason, many kinds of formers with different shapes and sizes are customarily provided and they are selectively used with a packaging machine. Japanese Patent Publication Tokkai 5-124606 discloses a packaging machine, of which the position of its sealing heater can be changed, depending on which of many available formers is installed. Since there are fluctuations in the shape and size of the formers due to production errors, the position of the sealer may require additional adjustments both in the radial and tangential directions. Moreover, the sealer may have to be tilted, even after it is correctly positioned, such that its tip will be accurately opposite to the surface of the former.

Thus, whenever a different former is installed for producing bags of a different kind, it becomes necessary not only to remove the endless belt and to adjust its position but also to carry out adjustments of the position of the sealing heater. In particular, since a prior art vertical sealer is usually so structured that its heater is axially supported by a shaft in its exterior, the tangential position of the tip of the heater with respect to the former is affected as the heater is rotated against this support shaft. The position adjustment of the heater is therefore made even more difficult to perform.

In accordance with the present invention, a longitudinal sealer for a packaging machine comprises a sealing unit including a heater; a mobile support member supporting said sealing unit; and Y-θ adjusting means for selectably moving said support member translationally in a Y-direction or for rotating said support member around an axis extending through said sealing unit.

The invention provides an improved longitudinal sealer for a packaging machine which can be adjusted easily and quickly according to the shape and the size of the bags to be formed.

The invention also provides a compact device for adjusting the position and orientation of a sealer in such a longitudinal sealer.

In a preferred example, the sealing unit is supported on a mobile member such that it can be moved by means of a unitized adjustment device not only in two mutually perpendicular directions but also selectably around an axis passing through the heater.

The accompanying drawings, which are incorporated in and form a part of this specification, illustrate an embodiment of the invention and, together with the description, serve to explain the principles of the invention. In the drawings:

Fig. 1 is a diagonal view of a longitudinal sealer embodying the present invention as incorporated in a packaging machine;

Fig. 2 is a diagonal view of a portion of the adjustment device in the longitudinal sealer of Fig. 1;

Fig. 3 is a partially sectional plan view of a portion of the adjustment device of Figs. 1 and 2;

Fig. 4 is a partially sectional side view of a portion of the adjustment device of Figs. 1-3;

Fig. 5 is a diagonal view of the display mechanism of the adjustment device of Figs. 1-4; and

Fig. 6 is a schematic diagonal view of a portion of a vertical pillow type form-fill-seal bag maker-packaging machine incorporating a longitudinal sealer embodying the present invention; and

Figs. 7(a) and 7(b) are plan views for showing operations of the adjustment device of Figs. 1-5.

In Fig. 1, numeral 1 generally indicates a longitudinal sealer according to an example of this invention, as a part of a vertical pillow-type form-fill-seal packaging machine of an ordinary kind having a former 90, a loading cylinder 91 and a hopper 92 arranged in a well known relationship with respect to one another. In order that the former 90 can be easily removed and replaced by a different one, an elongated member (herein referred to as the arm 2) is rotatably supported by a frame 93 around a support pin 3 and the longitudinal sealer 1 is supported near the free end of the arm 2 such that it can be retracted out of the way of the former when it is exchanged. The arm 2 is provided with a guide groove 4 extending longitudinally therealong. A generally Z-shaped support block 5 is supported by the arm 2 and engages with this groove 4 so as to be able to slide longitudinally on and along the arm 2. One end of the support block 5 distal from the arm 2 is formed as a gripper 11 equipped with bolts 12 for supporting a sealer unit 20 by gripping an adjustment device 30 therefor. The arm 2 also supports a position-controlling motor 6 with a helically threaded shaft 7 for controlling the position of the

support block 5 (in the Y-direction as indicated in Fig. 1) according to the size of the former 90 to be installed. The threaded shaft 7 of this motor 6 engages with a support table 8 supporting a cylinder 9 with a piston rod inside (of which the function will be described below).

The sealer unit 20 includes a base plate 21 extending parallel to the loading cylinder 91, a belt-driving motor 23 attached to the base plate 21, a driver pulley 25 mounted to the drive shaft of this motor 23, a follower pulley 26 axially supported by the base plate 21, an endless belt (or a seal belt) 27 stretched between the pulleys 25 and 26 so as to be rotated by the belt-driving motor 23, and a heater 28 disposed between the pulleys 25 and 26. Longitudinal sealing is effected by transmitting heat from the heater 28 through the belt 27 to mutually overlapping side edges of a bag-making sheet material (not shown) travelling downward along the outer peripheral surface of the loading cylinder 91.

As shown more clearly in Figs. 2, 3 and 4, the adjustment device 30 is comprised of a first adjustment unit 35 for adjusting the position of the heater 28 in the X-direction (as indicated in Figs. 2, 3 and 4) and a second adjustment unit 45 for adjusting both the position of the heater 28 in the Y-direction and its orientation. Numerals 37 indicate a pair of frame structures for the adjustment device 30 affixed to the base plate 21 of the sealer unit 20.

The first adjustment unit 35 includes a spline shaft 14, a worm wheel 36 and a worm gear 40. As shown most clearly in Fig. 3, the circumferential surface of the spline shaft 14 engages slidably with a mobile frame 38 which is affixed to the frame structures 37 of the device 30. A screw 31 is affixed to the front end of the spline shaft 14, and the worm wheel 36 is attached to the spline shaft 14 by engaging with the screw 31. The worm gear 40 is affixed to a shaft 42 which extends in the Y-direction and is supported rotatably by the frame structures 37 such that the worm gear 40 and the worm wheel 36 engage each other. Small flanking plates 39 are attached to inner surfaces of the frame structures 37 such that the worm wheel 36 is sandwiched between the front end of the mobile frame 38 and the flanking plates 39. A knob 41 with a calibration 43 is fastened to the shaft 42. As this knob 41 is rotated, the rotary motion of the worm gear 40 is communicated through the worm wheel 36, the spline shaft 14 and the mobile frame 38 and moves the frame structures 37, and hence also the second adjustment unit 45, in the X-direction, that is, in the tangential direction of the former 90. In order to show the actual displacement of the device 30 in the X-direction, a calibrated plate 44a is attached to the mobile frame 38 and an indicator 44b is affixed to a portion of the support block 5 such that the pointer of the indicator 44b will move along the calibrated plate 44a.

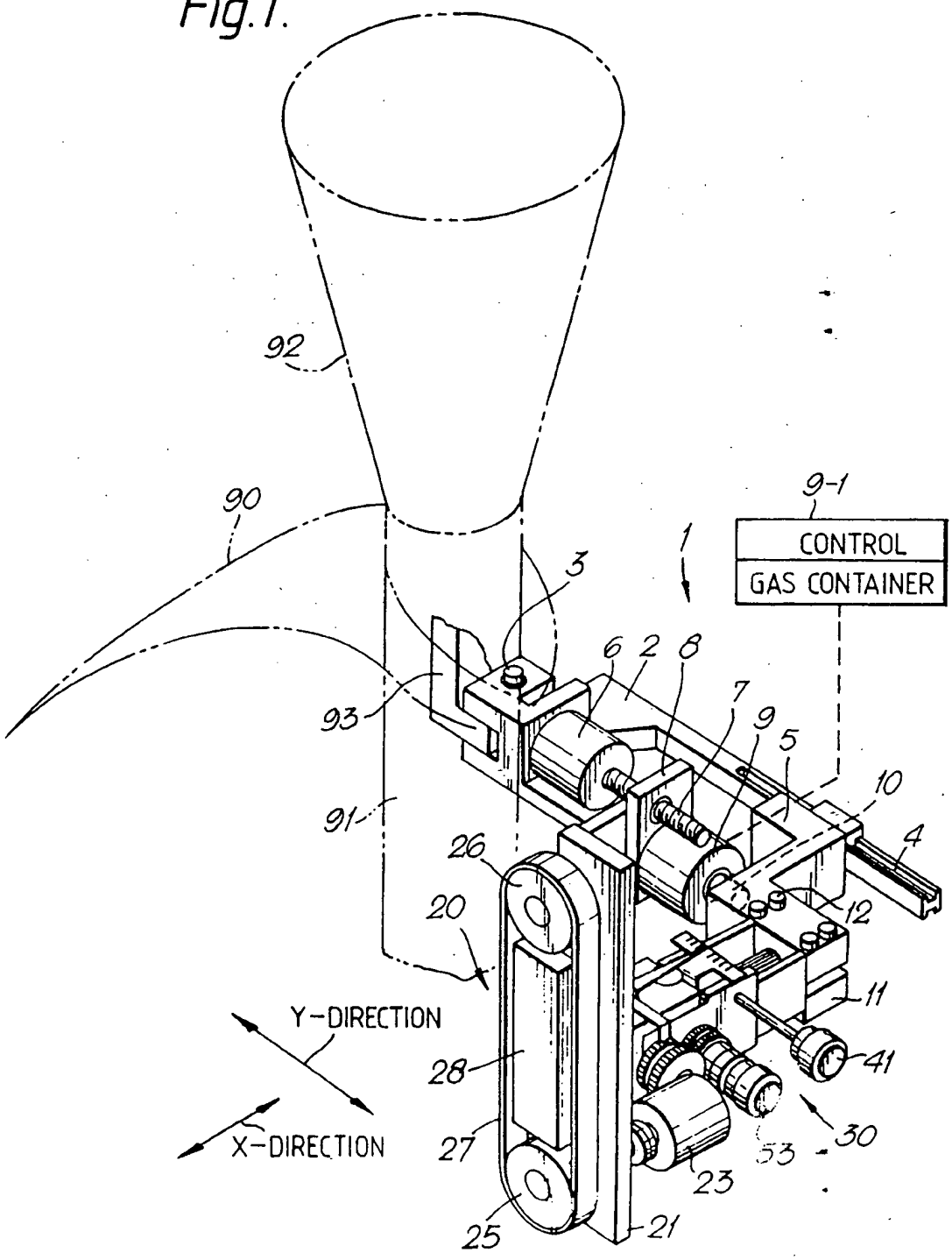
The second adjustment unit 45 is comprised basically of a pair of equally sized gear wheels and a pair of differently sized gear wheels and, which can be selectively engaged together for adjusting the position of the heater 28 in the Y-direction as well as its orientation. For this purpose, the frame structures 37 rotatably support a first shaft 46 and a second shaft 50 parallel to each other, extending in the Y-direction, with the first shaft 46 disposed closer to the heater 28. Both the first and second shafts 46 and 50 are helically threaded in mutually opposite directions. A portion of the first shaft 46 extends outside the frame structures 37, and a first gear wheel 47 and a second gear wheel 48 are affixed to this extended portion of the first shaft 46 with a spacer 49 disposed therebetween. Similarly, a portion of the second shaft 50 extends outside the frame structures 37, having a sleeve shaft 54 attached thereto so as to be slidable thereon and rotate therewith. A third gear wheel 51, a fourth gear when 52 and a knob 53 are attached to the sleeve shaft 54.

The first gear wheel 47 on the first shaft 46 and the third gear wheel 51 on the second shaft 50 are of the same size and engageable with each other. When these two gear wheels 47 and 51 are engaged to each other and rotate together, a mobile member 56, which is engaged to both the first and second shafts 46 and 50 respectively through engaging pieces 59 and 60, moves in the Y-direction. The second gear wheel 48 on the first shaft 46 and the fourth gear wheel 52 on the second shaft 50 are of different sizes so as to be also engageable with each other. Let L_1 and L_2 denote the distances respectively of the first and second shafts 46 and 50 from the heater 28 in the X-direction, as schematically shown in Fig. 3. The ratio between the diameters of the second and fourth gear wheels 48 and 52 is set equal to L_2/L_1 such that, when the gear wheels 48 and 51 are engaged to each other and rotate together, the mobile member 56 rotates around a vertical center axis 29 of the heater 28.

The mobile member 56 is cross-sectionally U-shaped, as seen sideways, with upper and lower horizontal plates 57 facing each other, as most clearly shown in Figs. 4 and 5. The engaging pieces 59 and 60, engaging respectively to the first and second shafts 46 and 50, are sandwiched between these plates 57 and rotatably supported thereby around pins 61 and 62, respectively. The front end surface 58 of the mobile member 56 is provided with a support pin 63, by which the base plate 21 is axially supported. A U-shaped spring holder 64 is attached on top of the upper plate 57 as shown in Fig. 5. Numeral 22 in Fig. 5 indicates a protrusion from the base plate 21 (which itself is not shown in Fig. 5), sandwiched between a pair of springs 65 both attached to the spring holder 64 such that the angle of the sealer unit 20 in the Y-direction can be adjusted.

Fig. 5 also shows a mechanism for displaying the adjustment made in the Y-direction as well as the ori-

Fig.1.


92
90
9-1
CONTROL
GAS CONTAINER
1
3
6
2
8
7
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10
4
93
91
26
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12
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Y-DIRECTION
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41
X-DIRECTION
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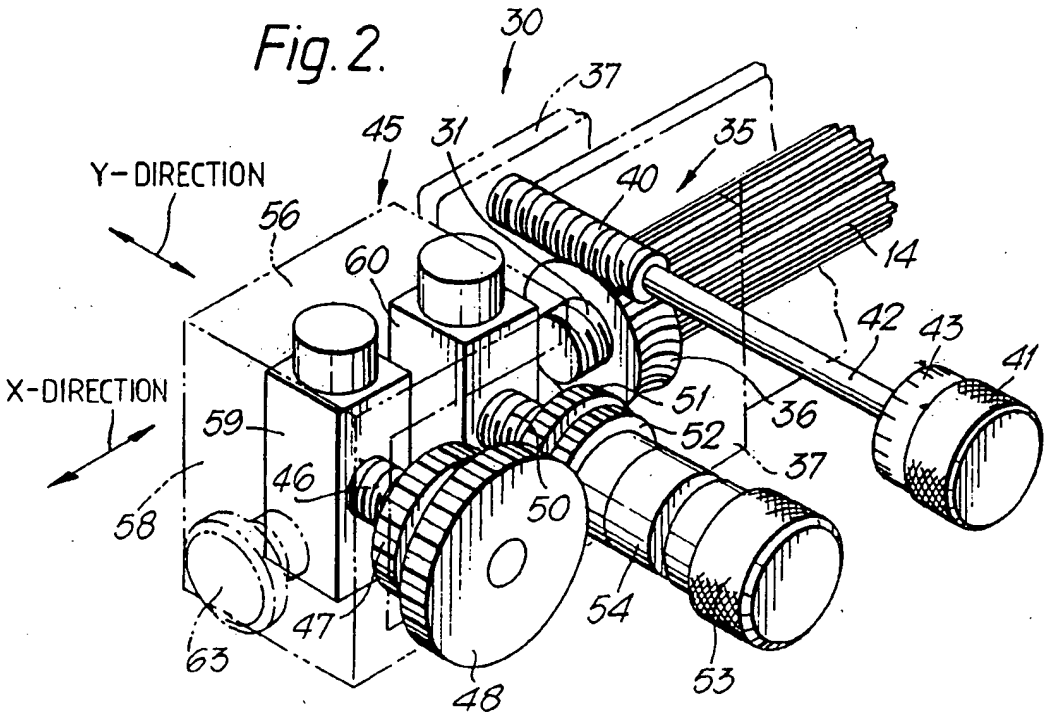
21

Fig. 2.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X-DIRECTION
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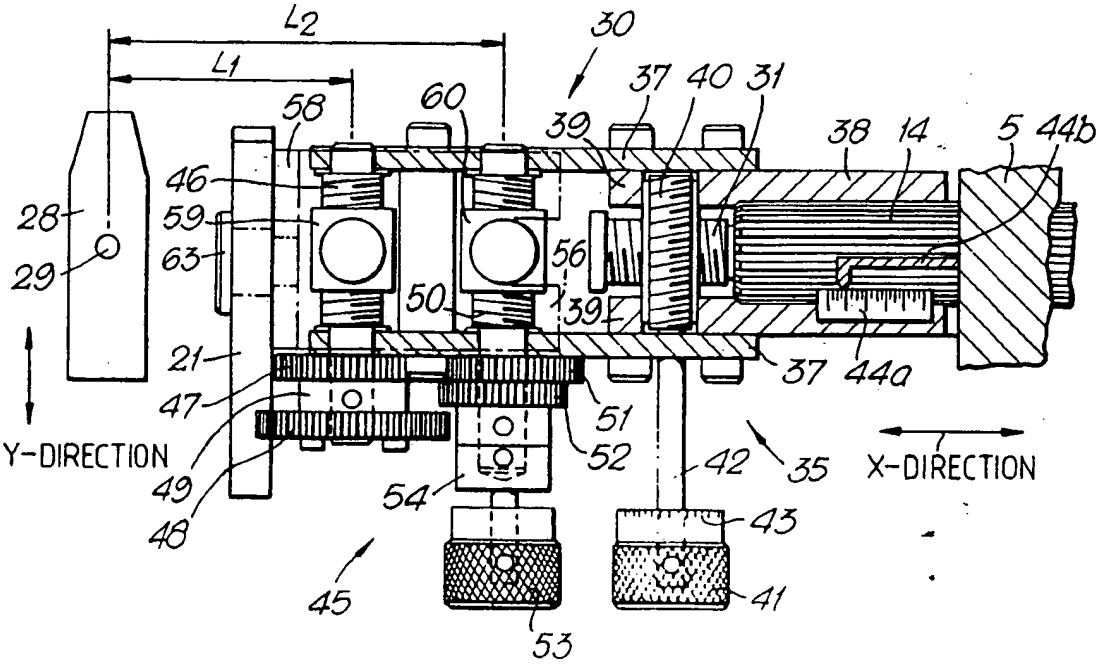
Fig. 3.


L2
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58
60
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21
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44a
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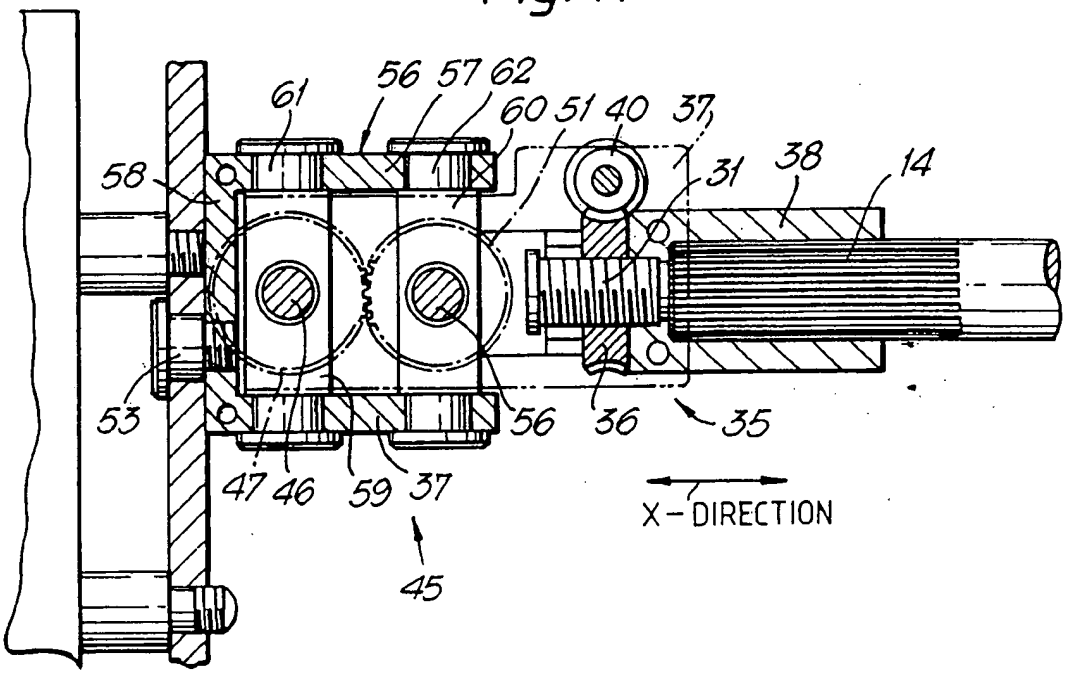
Fig.4.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X-DIRECTION

Fig.5.

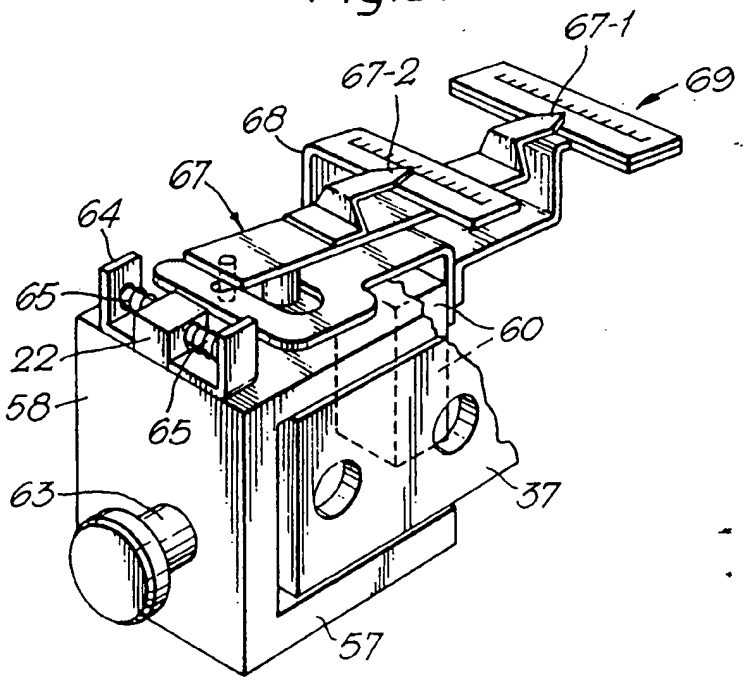
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Fig.6.

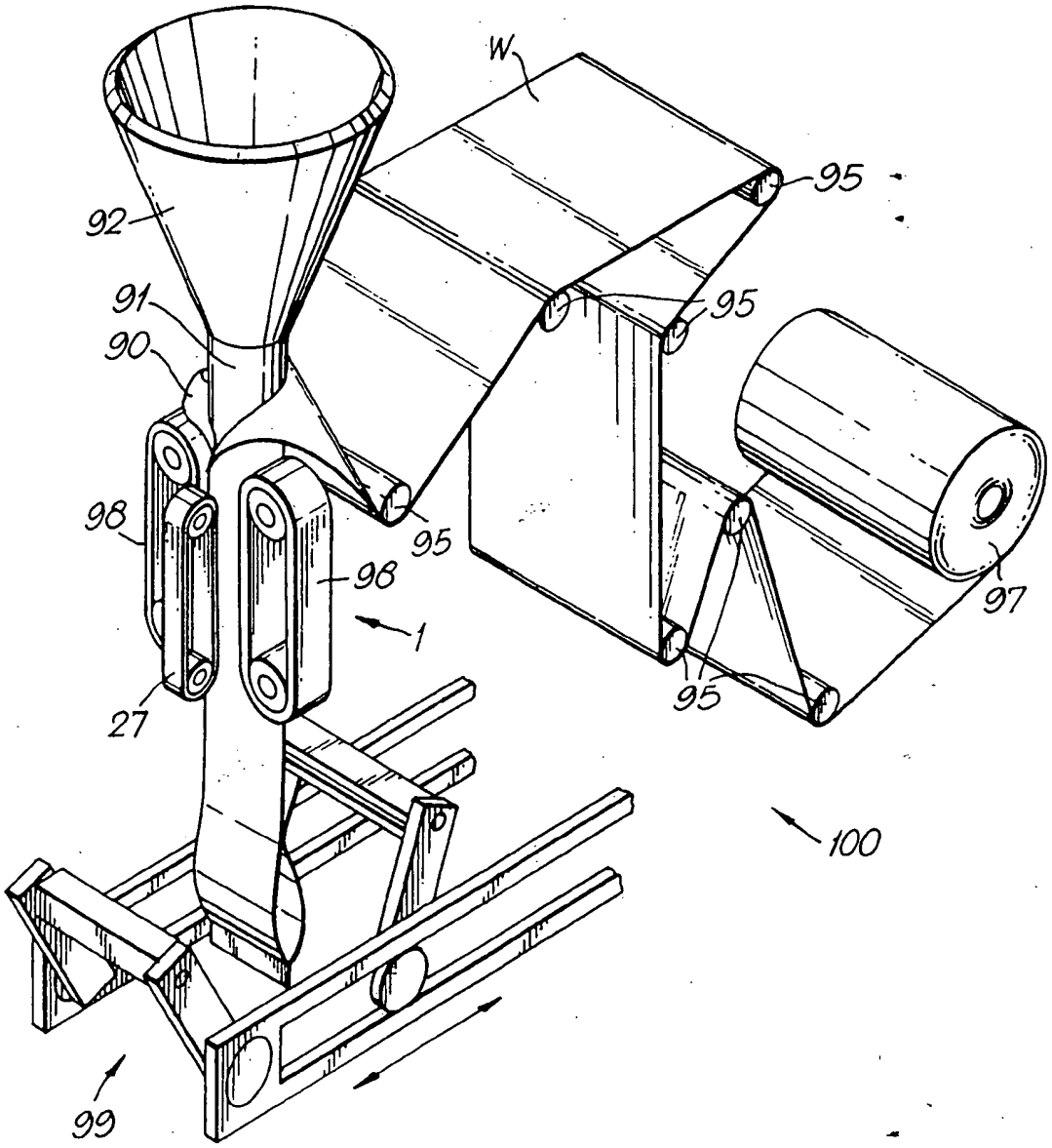

Fig. 7(a).

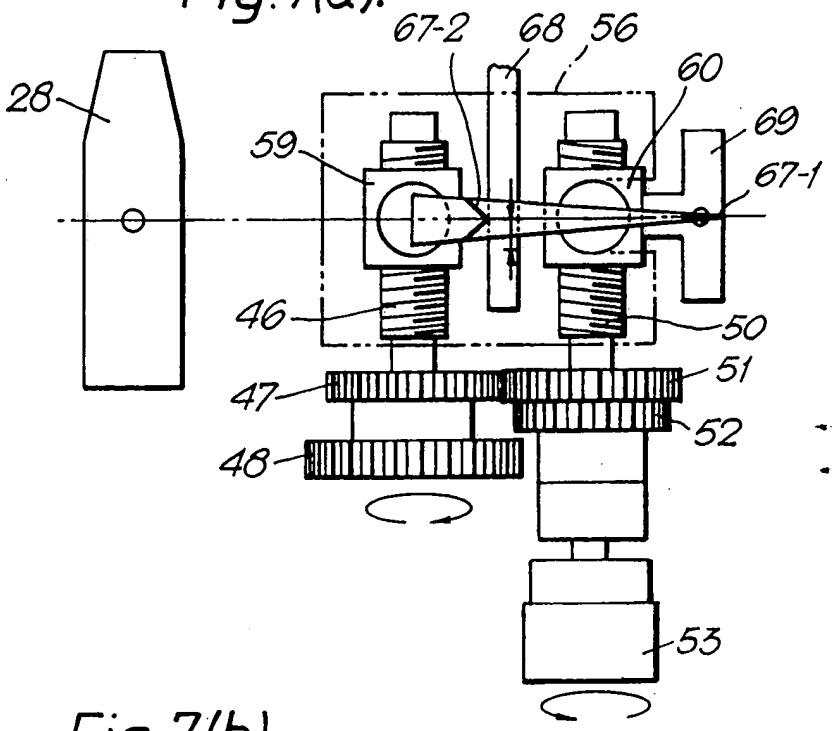
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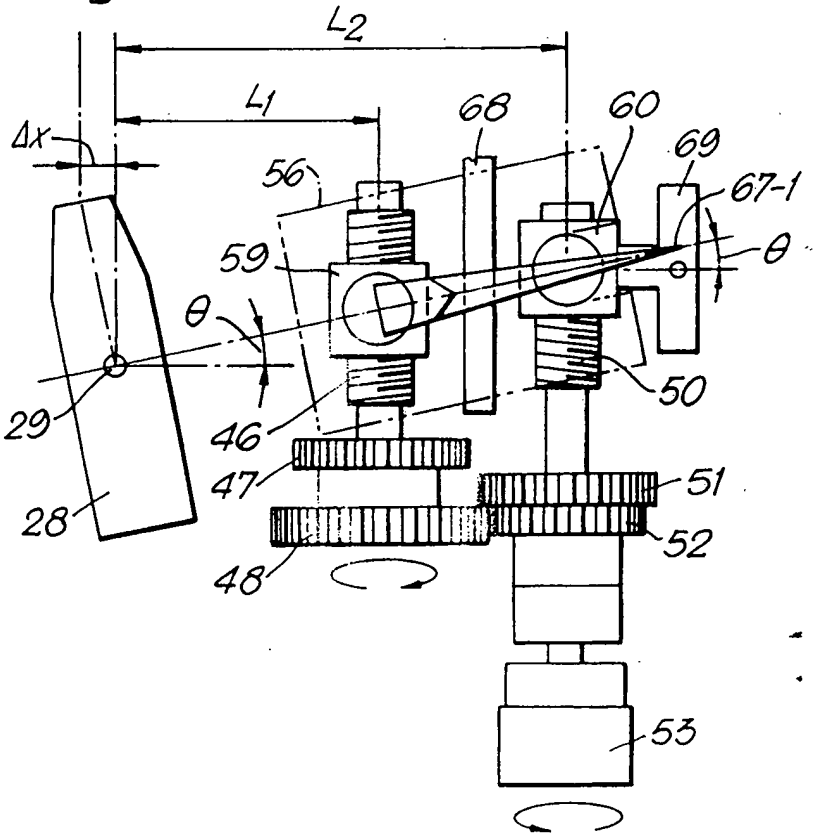
Fig. 7(b).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56
67-1
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θ
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29
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28
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